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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/780,638	02/10/2001	Stephen J. Williams	0225-0032.30	9345

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EXAMINER	
BROWN, JENNINE M	
ART UNIT	**PAPER NUMBER**
1755	

DATE MAILED: 12/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/780,638	WILLIAMS ET AL.
	Examiner	Art Unit
	Jennine M. Brown	1755

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 03 November 2003. THE AMENDMENT HAS BEEN ENTERED.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-19 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

Response to Amendment

The finality of the rejection of the last Office action is withdrawn in view of the new obviousness double patenting rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9 and 13-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Ramsey, et al. (US 5858187).

Ramsey, et al. teach a method and apparatus for injection of a fluorescently tagged liquid sample into a microfluidic device having a channel network as shown in Figure 1 where channels (21, 23) are axially spaced and intersect (26) and second axially spaced channels (21, 25) with another intersection (28). Sample injection is done through sample stacking to focus the sample. Figure 4 A illustrates movement of sample from wells into separation channels and waste by controlling the voltage to upstream and downstream channel portions and side channels. A sharpening of the boundaries of the sample volume at the channel intersection is illustrated in Figure 2. Axial and proximal spacings of said channels are illustrated by Figures 1 and 3, respectively. Electrophoretic separation inherently occurs in a sample with different electrophoretic mobilities, which are based on charge and size of the molecules. Some of these molecules will move slower (trailing) and some of these molecules will move faster (leading) causing separation of the molecules. Ramsey, et a. teach a method of moving an electrolyte

solution in the upstream channel successively through the first through third ports away from the electrolyte channel having the samples converge at the intersecting point and move downward, focusing the sample. (col. 2, l. 4-8; col. 3, l. 34-35; col. 4, l. 66 – col. 5, l. 5, 43-48; col. 7, l. 2, 33-36, 49-51; col. 9, l. 32 – col. 12, l. 43; Figures 1, 2, 4A, 14).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 10-12 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramsey, et al. (US 5858187) in view of Chow, et al. (US 6174675).

Ramsey, et al. teach a method and apparatus for injecting liquid sample as described above. Ramsey, et al. do not specifically teach the use of both AC and DC currents to perpendicular (axial) channels. Chow, et al. teach the use of both AC and DC currents and the use of AC and DC currents applied in a perpendicular method between at least three channels (col. 17, l. 31-63; col. 45, l. 16-33; Figure 19).

It would have been obvious to one of ordinary skill in the art to modify the apparatus of Ramsey, et al. to use both AC and DC voltage because sample stacking will occur when the current is alternating and a more highly concentrated sample will be separated using a direct current giving a more accurate quantitative result.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-22 of copending Application No. 09/933993. Although the conflicting claims are not identical, they are not patentably distinct from each other because pending claims both use a method of isotachophoretic movement of electrolytes to separate samples and the copending system seems to incorporate the corresponding features of the pending apparatus.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

Applicant's arguments filed 07/01/2003 have been fully considered but they are not persuasive.

1. Regarding the standard for anticipation, according to the MPEP, "for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present." Examiner emphasis added.

Exhibit 1

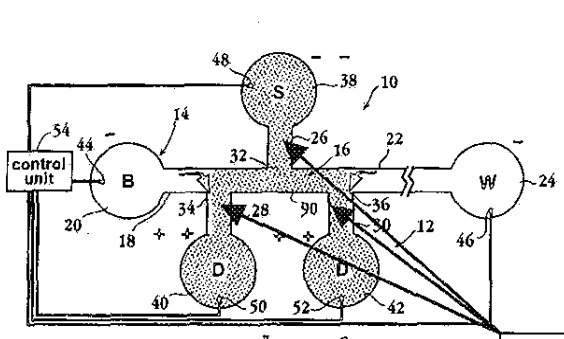
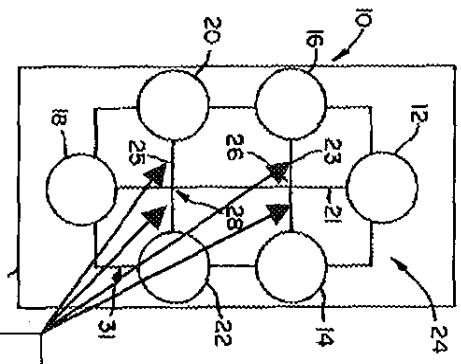


Fig. 1

Claimed

side channels



Prior Art

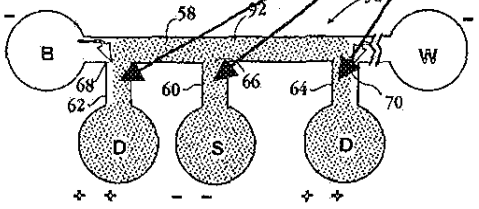


Fig. 2

Claimed

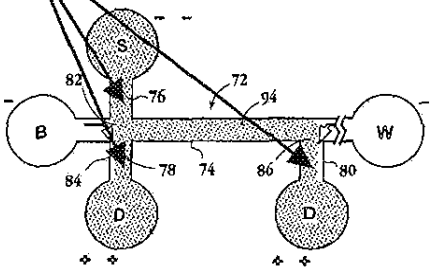


Fig. 3

Claimed

Apparatus/System Claims:

Independent claim 13 is drawn to a microfluidic system and not a method of using the microfluidic device.

As applicants stated in the Remarks, "Figures 1-3 of the specification illustrate three possible embodiments of a "channel network that includes an electrolyte channel having upstream and downstream channel portions and first, second, and third side channels five channels in all that intersect the electrolyte channel between the two channel portions at first, second, and third ports, respectively", where "at least one of the ports is axially spaced along the electrolyte channel from the other two ports", as recited in claims 1 and 13." Using said definition and looking at the claimed Figure 1 in Exhibit 1, Examiner assumes the upstream and downstream channel portions are represented by B (buffer) and W (waste) and first, second and third side channels represented by S, D and D. In the same manner Examiner views Prior Art and has determined that upstream and downstream portions are represented by the channel nearest (18) and opposing channel (21) nearest (12). Side channels are represented by (23), (25) and non numbered portions opposite these channels. Both prior art and claimed figures depict ports for supplying liquid medium to the electrolyte and side channels represented in circular format. Claimed and prior art figures depict intersections between channels. According to applicants, " ... the channels leading to 14, 16, 20, and 22 in Fig. 1 of Ramsey can be considered four "side channels". However, by this definition, four channels emanating from a single cross point, as in Figures 2, 4, and 14 of Ramsey, cannot include three "side channels"." and if Examiner applies the same logic as in the previous argumentation to applicants own figures, then Figure 3 would only have one side channel and therefore would not represent the apparatus as claimed by applicants in either claims 1 or 13.

Assuming applicants intent is not to invalidate Figure 3 and the portions of the specification and claims based on Figure 3, examiner assumes the argumentation was flawed.

Therefore, the number and placement of the third channel does not seem to be relevant to the inventive portion of the apparatus and method, rather the control unit, polarity of the electrodes and type of voltage or current used seems to determine the inventive step.

Although not shown, Ramsey, et al. disclose that "each reservoir is coupled to a voltage source 32 through platinum wires 34 that extend into the reservoirs." (col. 3, l. 62-64) These electrodes are coupled to one or more controllers. "The electric potentials at the sample reservoir 12, and focusing reservoirs 20 and 22 are controlled independently with multiple voltage sources. ... Alternatively a single voltage source in conjunction with an appropriate voltage divider could provide the multiple outputs." (col. 4, l. 17-24)

The primary claims 1 and 13 fail to describe a controlling step including an AC voltage to form a dielectric focusing field effective to concentrate sample components in the sample, therefore Ramsey et al do anticipate the apparatus claims.

Method Claims:

A method of injecting a liquid sample into an electrolyte channel in a microfluidic device has also been taught by Ramsey et al.

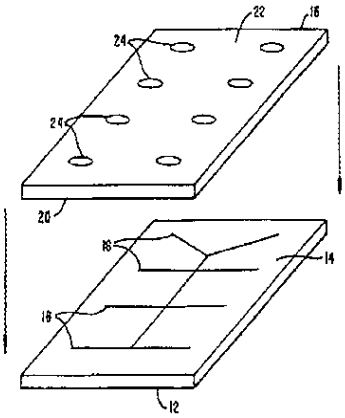
As stated in the prior action, using three electrodes on and one floating comes from Figures 4A and 14 in US 5858187 (Ramsey, et al.) which show sheath 1 and 2 headed towards the intersection as well as that of sample (col. 2, 1. 25-31; col. 3, 1. 4-6) towards the waste reservoir by "... providing a method of controlling material transport in an interconnected channel structure having at least three ports, which includes actively controlling the electric potential at the at least three ports to spatially control the lateral dimensions of a sample

stream" (col. 2, 1. 3-8). Furthermore, claim 16 states, "A method of testing a sample of material comprising the steps of: placing the sample in a first reservoir which is connected to a second reservoir through a first channel; placing a buffer material in a third reservoir which is connected to the first channel through a second channel; placing a buffer material in a fourth reservoir which is connected to the first channel through a third channel disposed opposite the second channel, said first, second and third channels forming a four-way intersection; applying voltages to the first, second, third, and fourth reservoirs to achieve lateral spatial confinement of the sample in the first channel; exposing the spatially confined sample to electromagnetic energy whose interaction characteristics vary in accordance with at least one property or condition of the sample." This shows simultaneous controlling of voltage to three side channels in order to concentrate the sample and analyze it.

Rejection is maintained.

2. 35 U.S.C. 103 Rejection

Exhibit 2



Prior Art

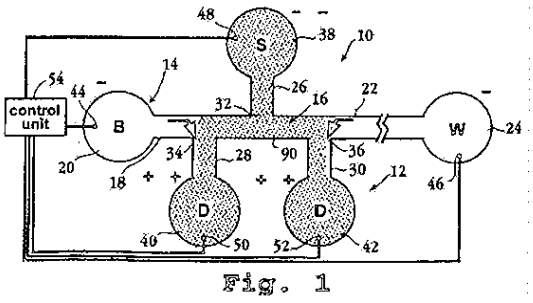


Fig. 1

Claimed

All argumentation related to the alignment and definition of side channels stands from the argumentation as stated previously and above. Furthermore, Examiner asserts that the controller of Chow, et al. which is a variable voltage controller that has a time multiplexed power supply that which delivers both DC and AC cures the deficiency of Ramsey et al.

Although Applicants would prefer to define the function of the AC as a method of heating the microfluidic device Chow has explicitly stated is used for dielectrophoretic control of sample in the microfluidic device and teaches a method of doing so for injection of a concentrated sample into and a separation capillary and can be used as a heating source.

Chow, et al. teach both apparatus and method in the following passage.

"[C]ontrolled electrokinetic material transport is readily utilized to create virtual valves, which include no mechanical or moving parts. Specifically, with reference to the cross intersection described above, flow of material from one channel segment to another, e.g., the left arm to the right arm of the horizontal channel, can be efficiently regulated, stopped and reinitiated, by a controlled flow from the vertical channel, e.g., from the bottom arm to the top arm of the vertical channel. Specifically, in the `off` mode, the material is transported from the left arm, through the intersection and into the top arm by applying a voltage gradient across the left and top termini. A constraining flow is directed from the bottom arm to the top arm by applying a similar voltage gradient along this path (from the bottom terminus to the top terminus). Metered amounts of material are then dispensed from the left arm into the right arm of the horizontal channel by switching the applied voltage gradient from left to top, to left to right. The amount of time and the voltage gradient applied dictates the amount of material that will be dispensed in this manner.

Although described for the purposes of illustration with respect to a four way, cross intersection, these controlled electrokinetic material transport systems can be readily adapted for more complex interconnected channel networks, e.g., arrays of interconnected parallel channels. (col. 11, l. 10-32) ...

As noted above, the systems described herein preferably utilize electrokinetic material direction and transport systems. As such, the controller systems for use in conjunction with the microfluidic devices typically include an electrical power supply and circuitry for concurrently delivering appropriate voltages to a plurality of electrodes that are placed in electrical contact with the fluids contained within the microfluidic devices. Examples of particularly preferred electrical controllers include those described in, e.g., U.S. Pat. No. 5,965,001 and International Patent Application No. US97/12930 filed Jul. 2, 1997, the disclosures of which are hereby incorporated herein by reference in their entirety for all purposes. In brief, the controller uses electric current control in the microfluidic system. The electrical current flow at a given electrode is directly related to the ionic flow along the channel(s) connecting the reservoir in which the electrode is placed. This is in contrast to the requirement of determining voltages at

various nodes along the channel in a voltage control system. Thus the voltages at the electrodes of the microfluidic system are set responsive to the electric currents flowing through the various electrodes of the system. This current control is less susceptible to dimensional variations in the process of creating the microfluidic system in the device itself. Current control permits far easier operations for pumping, valving, dispensing, mixing and concentrating subject materials and buffer fluids in a complex microfluidic system. Current control is also preferred for moderating undesired temperature effects within the channels. (col. 12, l. 17-45)

...

Still further, the power supply may apply any combination of DC, AC, and pulse, depending upon the application." (col. 17, l. 61-63)

Because the electrodes are used for material transport not solely heating of channels and/or chambers, it is directed to movement of material electroosmotically by AC, DC or pulsed methods as directed by computer and the power supply and does concern separation of materials and controlled flow by using the time multiplexed power supply which would provide Hz frequency of the voltage. As stated in the previous office action, herein and above, the motivation is present and taught for simultaneous control of three or more side channels and use of the controller of Chow, et al. which delivers both DC and AC cures the deficiency of Ramsey et al., therefore Examiner maintains previous 103(a) rejections.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennine M. Brown whose telephone number is (703) 305-0435. The examiner can normally be reached on M-F 8:00 AM - 6:00 PM; first Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Bell can be reached on (703) 308-3823. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

After the move to the new USPTO Headquarters in Alexandria, VA, tentatively scheduled for the week of December 22, 2003, the examiner's new phone number will be (571) 272-1364 and Mr. Bell's new phone number will be (571) 272-1362.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jmb

ELIZABETH WOOD
PRIMARY EXAMINER
AU 1755